ANSWER

Sessional Exam I

Q.1(a) Test for causality, memory & time Invariance

a) $$y[n] = \begin{cases} (-1)^n x[n] & x[n] \geq 0 \\ 2x[n] & x[n] < 0 \end{cases}$$

For all value of $x[n]$, output $y[n]$ depends on the present value of $x[n]$ only

∴ System is memoryless & Causal

Let $$y_1[n] = \begin{cases} (-1)^{n_0} x_1[n] & x_1[n] \geq 0 \\ 2x_1[n] & x_1[n] < 0 \end{cases}$$

For an input $x[n+n_0]$, the output will be

$$y_2[n] = \begin{cases} (-1)^n x[n+n_0] & x[n+n_0] \geq 0 \\ 2x[n+n_0] & x[n+n_0] < 0 \end{cases}$$

Now replace n by $n+n_0$ in the o/p $y[n]$, we have

$$y[n+n_0] = \begin{cases} (-1)^{n+n_0} x[n+n_0] & x[n+n_0] \geq 0 \\ 2x[n+n_0] & x[n+n_0] < 0 \end{cases}$$

If n_0 is odd, $y[n+n_0] \neq y_2[n]$

∴ Not time-invariant